C. A. MARTIN.

SPARK PLUG.

APPLICATION FILED MAR. 21, 1908.

941,157. Patented Nov. 23, 1909.

Fig. 1.

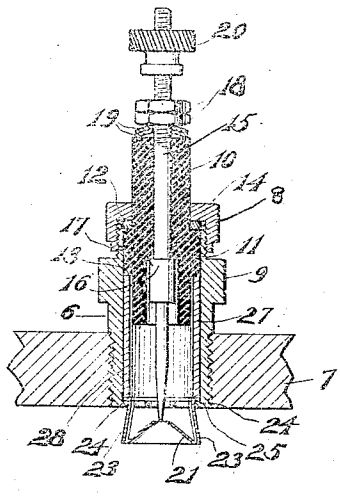


Fig. 2.

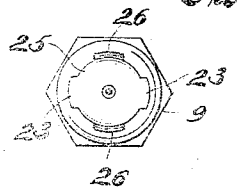


Fig. 2a.

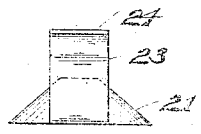


Fig. 5.

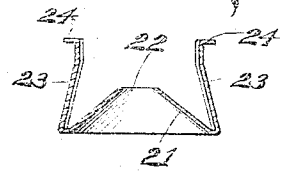
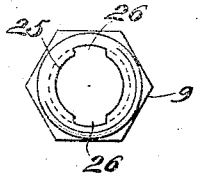


Fig. 3.



Witnesses.

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UNITED STATES PATENT OFFICE.

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SPARK-PLUG.

941,157. Specification of Letters Patent. Patented Nov. 23, 1909.

Application filed March 21, 1908. Serial No. 422,380.

To all whom it may concern:

Be it known that I, CHARLES A. MARTIN, residing in Racine, in the county of Racine and State of Wisconsin, have invented new and useful Improvements in Spark-Plugs, of which the following is a description, reference being had to the accompanying drawings, which are a part of this specification.

My invention has relation to improvements in spark plugs.

The important object of the invention is to provide a construction whereby accumulation of carbon, oil, and other sediment in a plug, tending to create a short circuit and thereby preventing the jumping of the spark, is guarded against.

A further object resides in providing for the removability of the guard, whereby when it is desired to detach the guard for any purpose, as for instance, to substitute for an old and worn guard, a new one, this may be readily accomplished.

With the above, and other incidental, objects in view the invention consists of the devices and parts, or their equivalents, as herein set forth.

In the accompanying drawing, Figure 1 is a longitudinal vertical sectional view of the complete device; Fig. 2 is a lower end view of Fig. 1; Fig. 3 is a view of the lower end of Fig. 1 with the guard removed; Fig. 4 is a detail view of the guard; and Fig. 5 is a sectional view of Fig. 4.

Referring to the drawing, the numeral 6 indicates the outer casing of the plug, which is provided at opposite ends with screw threads. The threads at the inner end are adapted to engage a threaded opening in the wall 7 of the engine cylinder, while the threads at the outer end are adapted to have a cap 8 turned thereon. Between its ends the casing is formed with an enlargement 9, preferably of hexagonal form for the application of a wrench thereto for the purpose of screwing the plug into or removing the same from the threaded opening of the cylinder wall.

The numeral 10 indicates an insulating tube which passes through an opening in the cap 8 and enters the casing to such an extent that substantially one-half of the length thereof is within the bore of the casing. At a point between its ends, the insulating tube is provided with an enlargement 11, said enlargement forming outer and inner shoulders 12 and 13, respectively. The outer shoulder forms a seat for a packing 14, said packing being confined between the shoulder and the under side of the cap 8.

Passing through the bore of the insulating tube is an electrical conductor 15 having its inner end pointed, as usual. Between its ends the conductor is enlarged, as clearly shown in the drawing, to form an outer shoulder 16, and in order to accommodate this shoulder and to provide a shoulder to coöperate therewith, the inner end of the bore of the insulating tube is also enlarged, the outer end of this enlarged portion of the bore forming a shoulder 17 against which the shoulder 16 is adapted to be drawn.

The conductor 15 is adjustably clamped to the insulating tube by means of nuts 18, 18 turned upon the threaded outer end of said conductor. Interposed between the lower of these nuts and the outer end of the insulating tube are washers 19, 19. In view of the fact that the insulating tube becomes extremely hot when in use, I prefer that the washers 19 be spring washers, so that yielding pressure against the end of the insulating tube is provided, whereby the danger of cracking the heated porcelain of which the tube is composed, is considerably lessened.

Above the nuts 18 a binding nut 20 is turned on to the threads of the conductor 15, said binding nut adapted to clamp between itself and the upper one of the nuts 18 the electrical wire (not shown) which runs to said electrical conductor 15.

The improved form of guard employed by me is indicated by the numeral 21. This guard is of conical form, the cone extending outwardly. At the apex of the cone the guard is formed with an orifice or small opening 22. The guard is suspended or held below the inner end of the casing 6, and by reason of the conical shape thereof, any carbon, oil, or other sediment, which may drop from the inner end of the casing on to the outer side of the cone is by reason of the sloping walls of the cone shed or discharged. The same is true in regard to any carbon, or other matter, which may accumulate on the inner side of the guard, inasmuch as the sloping formation thereof will necessarily cause the carbon or other matter to readily slide off or discharge.

A great disadvantage in many forms of spark plugs as now constructed is that no provision is made for preventing the accu-

mulation of carbon, oil etc., and hence short circuits are caused with a consequent interference with an effective jumping of the sparks. This is particularly true of those constructions wherein the inner end of the casing is formed with a downwardly or inwardly pointing conical bottom, or with a straight bottom. Such formations of the bottoms of the casings necessarily provide pockets or receptacles in which the clogging substances accumulate. By my improved construction of guard, however, wherein the cone points upwardly or outwardly, the sloping walls of the cone must necessarily act to prevent the accumulation of carbon etc., as herein before fully explained.

The guard should be so suspended below the inner end of the casing that almost an unobstructed space is left between said end of the casing and the guard or deflector, whereby the carbon or other matter lodging on the outer side of the cone will have free opportunity to escape. To provide for this, I form the conical guard with outwardly extending arms 23, preferably two in number, and also preferably sloping inwardly, the outer ends of said arms being secured to the inner end of the casing. Of course the arms could be rigidly secured, but I prefer that they be connected so as to be readily detachable, whereby the guard is capable of being easily removed when necessary, as when it becomes worn and needs to be replaced by a new guard. To accomplish this, I bend outwardly the outer ends of the arms to form laterally extending projections 24, 24, which projections are adapted to seat themselves upon an inwardly extending ledge or flange 25 formed at the inner end of the casing 6. This ledge or flange is provided at diametrically opposite points with recesses 26, 26. In order to attach the guard, the arms 23 are pressed inwardly at their outer ends, and the lateral projections 24 are passed through the recesses 26. The arms are then permitted to spring outwardly, and by turning the guard the projections 24 will rest or seat themselves upon the flange 25 of the casing, and be thereby held in place. When it is desired to remove or detach the guard, it is turned until the projections 24 are in registration with the slots 25. At this position, it is obvious that the guard may be readily withdrawn. In order to clamp the guard in place, I provide an inner sleeve 27, the outer end of said sleeve bearing against the inner shoulder 13 of the insulating tube, and the inner end of said sleeve bearing against the lateral projections 24 of the arms 23 of the guard. It is obvious that when the cap 8 is turned toward the cylinder of the engine the shoulder 13 is brought firmly against the outer end of the sleeve 27, which of course will cause the inner end of said sleeve to engage firmly against the projections 24. The small opening or orifice 22 of the guard is formed by planing or cutting off the apex of the cone. This will necessarily make the bordering edge of the orifice quite sharp, said sharp edge assisting materially the jump of the spark from the pointed inner end of the electrical conductor 15.

I prefer that the guard and its outwardly extending arms be made of thin copper. Copper, as is well understood, is of such nature as to become heated to a high degree. This intense heat will therefore serve to assist in preventing the accumulation of carbon and other matter, inasmuch as it will serve to burn off the said carbon or other matter. By this provision, therefore, even though the sloping wall of the cone does not shed off all the carbon and sediment, yet the heat emanating from the copper of which the guard is composed will burn any remaining carbon.

It will be seen that I provide a chamber 28 in the inner end of the casing 6 of considerable area. A small quantity of gas from the engine cylinder enters this chamber, and this gas is first ignited by the spark. The explosion therefore which occurs in chamber 28 will create a draft in the direction of the cylinder, and this draft will also assist in cleaning and quickly removing obstructions of carbon or other deposits.

What I claim as my invention is:

1. In a spark plug, the combination of an outer casing adapted to be screwed into the cylinder wall of an engine, the inner end of said casing provided with an inwardly extending ledge or flange, said ledge or flange provided with recesses, an insulating tube extending inwardly into the casing to a desired extent, a guard or deflector, the end thereof being in the form of an outwardly extending cone and having the apex thereof pointing toward the casing and apertured, the said end provided with arms extending toward the casing, the ends of the arms being bent outwardly to form lateral projections which are adapted to be passed through the recesses of the ledge or flange of the casing and to thereby detachably engage above said ledge or flange, and an electrical conductor extending through the insulating tube, and having its inner end in close proximity to the aperture.

2. In a spark plug, the combination of an outer casing adapted to be screwed into the cylinder wall of an engine, the inner end of said casing provided with an inwardly extending ledge or flange, said ledge or flange provided with recesses, an insulating tube extending inwardly into the casing to a desired extent, said tube formed with an enlargement between its ends to provide outer and inner shoulders thereon, a guard or deflector, the end thereof being in the form of

an outwardly extending cone, with a spark orifice at the apex of the cone, and said end provided with arms extending toward the casing, the ends of the arms being bent to form lateral projections which are adapted to be passed through the recesses of the ledge or flange of the casing and to be thereby detachably engaged beyond said ledge or flange a sleeve within the casing, the outer end of said sleeve being in engagement with the inner shoulder of the insulating tube, and the inner end of said sleeve engaging against the lateral projections at the ends of the arms of the guard, a nut turned on to the outer end of the casing said nut provided with an opening through which the insulating tube passes, and said nut adapted to be turned down against the outer shoulder of the insulating tube, and an electrical conductor extending through the insulating tube and having its inner end in close proximity to the spark orifice.

3. In a spark plug, the combination of an outer casing adapted to be screwed into the cylinder wall of an engine, an insulating tube extending inwardly into the casing to a desired extent, a removable open sided guard or deflector held between the inner end of the casing and the insulating tube, and the end thereof being in the form of an outwardly extending cone having the apex thereof pointing toward the casing and forming a spark terminal, with a spark orifice at the apex of the cone, and an electrical conductor extending through the insulating tube and having its inner end in close proximity to the spark orifice of the guard and forming the other spark terminal.

4. A guard or deflector for a spark plug, having an open side and an end piece and provided with attaching projections, the end piece being in the form of an outwardly extending cone having the apex thereof pointing toward the plug and being planed or cut off to form both a spark orifice and a spark terminal having a thin bordering edge.

In testimony whereof, I affix my signature, in presence of two witnesses.

CHARLES A. MARTIN.

Witnesses:

A. L. MORSELL,

ANNA F. SCHMIDTBAUER.